POTASSIUM CHANNEL OPENER

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This application is a continuation-in-part of PCT/JP02/04085, filed April 24, 2002, and claims priority to Japanese Patent Application No. 2001-127054, filed April 25, 2001 and Application No. 2001-337723, filed November 02, 2001.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a potassium channel opener.

2. Background Art

Calcium-activated potassium channel (alternatively referred to as "BK channel") is present on cell membranes and is a protein which makes potassium ions permeate selectively. This channel protein has a calcium binding domain in an amino acid sequence facing intracellularly, and has a property of enhancing channel activity by binding of calcium. This means, the increase of intracellular calcium concentration leads to a higher chance of opening of the calcium-activated potassium channel (opening probability), thereby leading to an increase in permeability of cell membrane for potassium. There have been known three kinds of calcium-activated potassium channels, among which large conductance calcium-activated potassium channels are present in smooth muscles which are constituents of various kinds of organs, including blood vessel, bladder, bronchial tube, gastrointestinal tract, etc., and central or peripheral neuronal cells, however, they are not expressed in cardiac muscles.

Membrane potential is dependent on a balance of permeabilities of cell membrane for ions such as sodium, potassium, chloride, calcium, etc. When the potassium channel opening is selectively increased, potassium permeability becomes dominant, and cell is hyperpolarized. Therefore, opening of the calcium-activated potassium channels, for example, hyperpolarizes smooth muscle cells,